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Nebraska GIS Steering Committee

Annual Report December 1999



*Coordinating the Implementation of GIS Technology at
the State and Local Government Level*

NEBRASKA GEOGRAPHIC INFORMATION SYSTEMS
STEERING COMMITTEE

ANNUAL REPORT

December 1999

Compiled by
Larry K. Zink
Coordinator, GIS Steering Committee

Executive Summary

Annual Report, December 1999 Nebraska Geographic Information Systems Steering Committee

In this annual report, the Nebraska GIS Steering Committee provides an overview of activities and some of the significant GIS-related initiatives that have been undertaken during the last year. As an intergovernmental coordinating body, created by the Legislature in 1991, the GIS Steering Committee seeks to ensure that public investments in GIS technology are achieved in a coordinated, efficient manner. Included in this report, are highlights and background information on the Nebraska GIS Steering Committee's efforts in the following areas.

The Development of Priority Statewide Geospatial Databases. One of the most cost-effective areas of GIS coordination is in the development and maintenance of commonly used geospatial databases. This report outlines which databases, because of their wide spread use, have been prioritized for development. The report also provides an update on database development efforts and intergovernmental planning efforts related to future development, maintenance and distribution of priority databases. The report also provides background information related to the GIS Steering Committee's support for the establishment of a funding mechanism to facilitate cooperative geospatial database development.

Facilitating Local Government Land Record Modernization. The modernization of how land records are maintained at the local government level, is one of the most promising areas for future GIS application. The report outlines several initiatives designed to facilitate this local government modernization. Among these initiatives are efforts to develop a Guidebook for Local Government Multipurpose Land Information Systems and an effort to develop a Public Land Survey System (section corners) database for Nebraska.

Outreach and Education Activities. Education is one of the most powerful tools the GIS Steering Committee has to achieve its coordination role. Outreach and education is particularly important in relationship to local government officials. This report provides an overview of several education efforts and includes a recommendation for an enhanced GIS outreach and education program.

Developing Relationship with NITC and CIO. In response to the new information technology coordination initiatives enacted by the Legislature in 1998, the GIS Steering Committee is working to further define its relationship with the Nebraska Information Technology Commission and Chief Information Officer. This report includes an overview of those efforts and a summary of the Steering Committee recommendations forwarded to the NITC for possible inclusion in the State Technology Plan.

**Nebraska Geographic Information Systems Steering Committee
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Nebraska Geographic Information Systems Steering Committee

INTRODUCTION

The Geographic Information System Steering Committee was established by the Legislature in 1991 (*Reissued Revised Statutes of Nebraska, 1943, §81-2601 through §81-2605, Appendix A page 14*), in an effort to coordinate the implementation of GIS technology by state and local government in Nebraska. Geographic Information System (GIS) is a powerful information technology that has numerous applications in both the public and private sectors. The role of the Steering Committee is to see that public investment in GIS technology is achieved in a coordinated efficient manner.

As required by statute, the GIS Steering Committee produces an Annual Report that is submitted to the Governor, the Clerk of the Legislature, the Nebraska Intergovernmental Data Communications Advisory Council, and Nebraska's Chief Information Officer.

GIS Steering Committee Priorities. The GIS Steering Committee has adopted three long-range program goals to guide its efforts over the next several years. This report provides an overview of recent GIS Steering Committee activities in these general areas and an outline of the initiatives currently underway or planned. The long-range goals adopted by the Steering Committee are as follows:

- **Priority Database Development.** Actively coordinate the development, maintenance, and distribution of priority statewide digital geospatial databases.
- **Land Record Modernization.** The promotion and facilitation of local government land record modernization and GIS development.
- **GIS Education Efforts.** Strengthen the GIS Education Subcommittee and its overall educational program activities.

In addition to these items, this report also provides background information on some of the GIS-related public policy issues considered by the Steering Committee.

THE DEVELOPMENT OF PRIORITY STATEWIDE GEOSPATIAL DATABASES

The Nebraska GIS Steering Committee has recognized for some time, that one of its most effective areas of focus is coordinating the development and maintenance of statewide geospatial databases that are needed by a broad cross-section of geospatial data users. Because the GIS Steering Committee does not have the resources to directly develop these priority databases, it must pursue this goal by:

- identifying and highlighting those databases it feels are priorities for development,
- working with others to outline and endorse related database standards,
- facilitating database development and maintenance partnerships, and
- providing support and encouragement to the database developers.

IDENTIFYING PRIORITY STATEWIDE DATABASES

There is a national (state, federal, and local) consensus around the importance of cooperative intergovernmental efforts to develop and maintain a core subset of standard geospatial databases that have become collectively known as Framework Databases. The following databases have been highlighted as Framework Databases because of their importance to a wide variety of geospatial data applications, the foundation that they provide for the development of other geospatial databases, and the role that they play in integrating other geospatial data.

- Transportation
- Digital Orthoimagery (aerial photography)
- Political or Governmental Boundaries
- Public Land Survey System (section corners)
- Hydrography
- Elevation Data
- Geodetic Control
- Property Parcels

The GIS Steering Committee concurs with the importance of the above Framework Databases and believes that they are a vital component of our public information technology infrastructure. The Committee has also added the two additional geospatial databases, which have particular importance to Nebraska, to its list of priority databases.

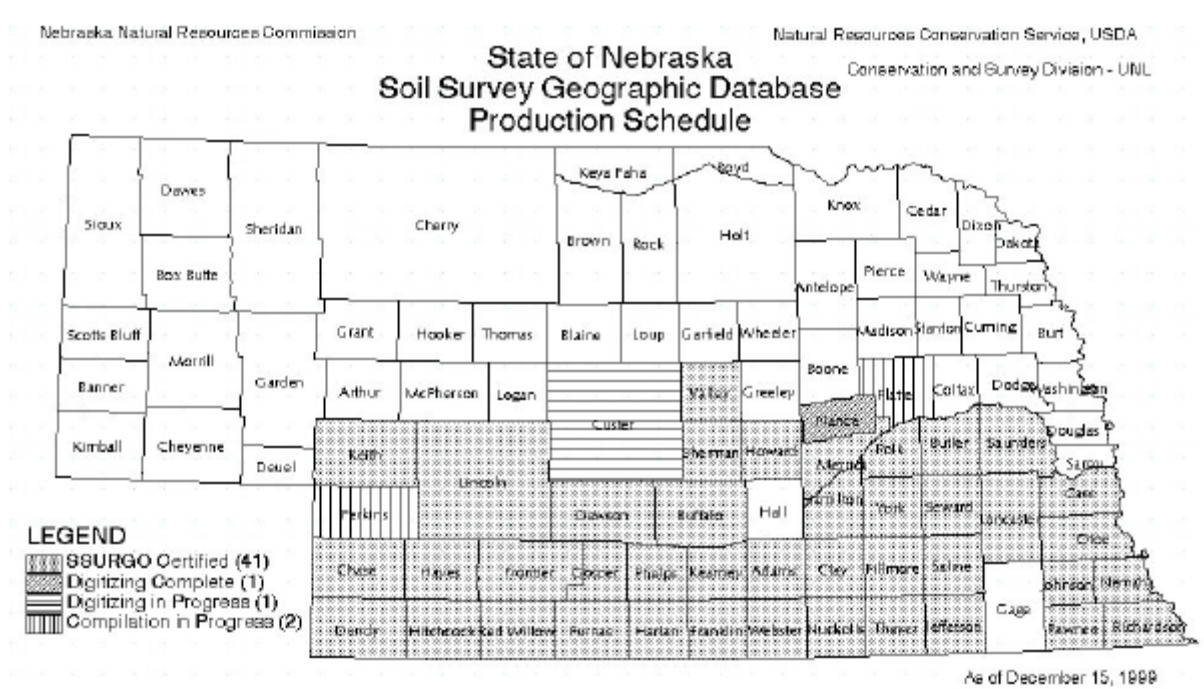
- Digital County Soil Surveys
- Land Cover/Land Use

UPDATE ON CURRENT DATABASE DEVELOPMENT EFFORTS

The GIS Steering Committee encourages and supports state agency leadership and interagency, intergovernmental partnerships to develop priority geospatial databases. Due to agency leadership and partnerships, noteworthy progress has been made in the development of several priority geospatial databases over the last year.

Digital Orthoimagery and Elevation Data. As a result of a three-year partnership agreement between the Nebraska Natural Resources Commission and the U.S. Geological Survey (USGS), statewide databases of Digital Orthophoto Quads (DOQs) and Digital Elevation Models (DEMs) were completed early in 1999. This highly successful effort has produced statewide, terrain-corrected, geographically-referenced aerial photography with a spatial accuracy of ± 33 feet for major surface features. The source data was 1992-93 aerial photography collected under another interagency federal program. This joint effort has also produced a statewide 1:24,000-scale digital model of Nebraska's surface terrain based on 30-meter interval elevation sampling.

County Soil Surveys. Digital county soil surveys (SSURGO soils) databases are being developed under another joint partnership effort between the USDA - Natural Resources Conservation Service, the Nebraska Natural Resources Commission and the Conservation and Survey Division - UNL. As part of this effort, county soil survey maps are converted into geospatial databases (known as SSURGO soils) and related databases developed which contain the digital information describing the characteristics of the various soil types. When completed, these geospatial databases can be overlaid on property parcels or farm field database/maps to readily determine the soil types, and amount of each, in different parcels or fields. Nebraska encompasses a large geographic area and this is a huge undertaking, which was originally estimated to require five years to complete. This project is currently ahead of schedule and the map below illustrates the status of each county's soil survey.



Public Land Survey System. The over 100,000 section corners of the Public Land Survey System (PLSS) provide the legal foundation for defining all land ownership in our state. These corners were originally surveyed over 100 years ago. To provide the framework upon which to bring property ownership records into a local government GIS, it is necessary to determine reasonably accurate locational coordinates of the original placement of these corners. The GIS Steering Committee has worked with the State Surveyors Office to organize pilot projects to test a methodology for developing an upgradeable database with mathematically estimated PLSS corner coordinates. This process has been successfully used to develop a PLSS database for Adams, Merrick, and Dodge Counties. In Adams County, this PLSS database is being used as a foundation upon which to develop a property parcel database in a local government GIS. The State Surveyors Office is working with the Dept. of Property Assessment and Taxation to use the PLSS database in Dodge County to develop digital property parcel maps.

PLANNING FOR FUTURE PRIORITY DATABASE DEVELOPMENT

In response to its prioritization of a select subset of geospatial databases for development, the GIS Steering Committee has authorized the formation of specific Database Advisory Committees for the following priority geospatial database themes:

- Water Resources
- Land Cover / Land Use
- Transportation.
- Orthoimagery and Elevation
- Governmental Unit Boundaries

Water Resources Database Advisory Committee. The Dept. of Water Resources was asked to act as the lead agency for this intergovernmental planning effort related to water resource-related geospatial databases. The Advisory Committee identified and prioritized 26 different water resources-related geospatial databases that are used or needed by state, local and federal agencies. Two types of databases emerged as clear priorities for coordinated development: surface water features and registered water wells. A subcommittee was organized for each database.

Surface Water Features. An intergovernmental subcommittee determined that while appropriate for the time and purpose for which they were originally developed, currently available databases of this type do not include many of the stream segments and stream banks needed for current applications. It was also noted to facilitate interagency data sharing, there was a need for the development of a standard reference surface water database that incorporated a standard numerical identification scheme for stream segments and other surface water features.

The subcommittee determined that a model National Hydrography Database (NHD) developed jointly by the EPA and USGS incorporated features that would address many of these identified needs. However, it was also determined that since the EPA/USGS NHD was being developed at a 1:100,000 scale, it would not have sufficient spatial accuracy for many state and local applications, for which a 1:24,000 scale database would be more appropriate. Based on the recommendations of this subcommittee, the GIS Steering Committee passed a resolution (*see page 18*) endorsing the development of a statewide 1:24,000 National Hydrography Database (NHD) and a pilot project to further define database standards, optimum development methodologies, and resource requirements. Efforts are now underway to define an interagency agreement for such a NHD pilot project.

Registered Water Wells. Another intergovernmental subcommittee of the Water Resources Database Advisory Committee focused their efforts on enhancing the locational information associated with registered water wells. The Dept. of Water Resources maintains a database of over 100,000 registered Nebraska water wells. This database contains information on the location of these water wells that has been mathematically estimated based on the section or quarter-section information listed on their original registration form. The subcommittee determined that several agencies were independently collecting, for their own agency program needs, more accurate information on the location of these wells using Global Positioning Satellite (GPS) technology. However, this enhanced locational information (already collected on over 16,000 wells) was not finding its way back to the DWR to be incorporated into its standard reference registered wells database. To facilitate the incorporation of this independently collected, enhanced locational data into this standard reference database the subcommittee developed standard documentation procedures and worked with the DWR to develop procedures for batch processing of this data from other agencies. The GIS Steering Committee passed a resolution supporting DWR's efforts in this area and urging other agencies participation (*see page 19*).

Orthoimagery and Elevation Database Advisory Committee. The Natural Resources Commission was asked to serve as the lead agency for this intergovernmental committee to research and develop action plan proposals to address the future need for digital orthoimagery and digital elevation data. This effort builds on the recently completed NRC/USGS joint effort to develop statewide Digital Orthophoto Quadrangles (DOQs) and Digital Elevation Models (DEMs) databases. These recently completed DOQs were based on 1992-93 aerial photography. As a result of a federal agency program (USGS), new statewide aerial photography was collected in 1999. For some agency applications, the currency of the aerial photography is an importance consideration, therefore this Advisory Committee has recommended undertaking a Lancaster County pilot project to determine the optimum production methodologies, product specifications, and resource requirements to develop a revised, updated DOQ/DEM for Nebraska. The GIS Steering Committee passed a resolution endorsing this pilot project effort (*see page 20*) and the NRC has signed an interagency workshare agreement with the USGS to implement a pilot project.

Land Cover / Land Use Database Advisory Committee. The Conservation and Survey Division - UNL was asked to serve as the lead agency for this intergovernmental committee to research and develop action proposals related to the development of geospatial land cover/use databases. The committee has met a couple times to develop a shared baseline understanding of current efforts, uses, and needs. The committee, which includes state, local and federal agency representatives, has found a wide variety of needs relative to spatial accuracy and classification schemes. Future meetings will focus on exploring the possibilities of nested classification schemes, which might facilitate the integration of varying datasets.

Governmental Boundaries Database Advisory Committee. The Clerk of the Legislature, through Legislative Technical Services, was asked to serve as the lead agency for this intergovernmental effort. Preliminary research has been undertaken prior to convening a larger advisory committee. That research has identified several geospatial databases related to governmental or political boundaries for which there appears to be a broad cross-section of need. The initial research has indicated that for several of these widely-needed databases, relatively current digital geospatial databases appear to exist, however they are not well documented or widely known. For these databases, efforts are needed to develop standard documentation to facilitate their access and use by the broader geospatial data user community.

- | | |
|----------------------------|--------------------------------------|
| • Legislative Districts | • Congressional Districts |
| • Public Service Districts | • State Board of Education Districts |
| • Board of Regents | • Supreme Court Districts |
| • Voting Precincts | • Natural Resources Districts |
| • Counties | • Township/Range |
| • Fire Districts | • Game and Parks Districts |
| • School Districts | |

For another set of governmental boundaries, the availability of this data in relatively complete, current, and digital format is in doubt. Further research is needed to determine who maintains the most current version of this data, what is the current format, and how can we establish a system to maintain current data in a publicly-available digital geospatial format. Probably the most widely-needed and challenging of these databases is municipal boundaries.

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|------------------------|--------------------------|
| • Municipal Boundaries | • Public Power Districts |
| • Census | • Tribal Lands |

Transportation Database Advisory Committee. The Dept. of Roads (NDOR) was asked to serve as the lead agency for this intergovernmental database advisory committee. Prior to convening a larger database advisory committee the NDOR has attempted to outline the scope and nature of the committee's challenge. Nebraska has approximately 95,910 miles of state and local roads. NDOR has created and maintains digital graphics and associated attribute records for 9,967 miles of state-maintained highways in Nebraska, at a scale of 1:24,000. Another 10,367 miles of local arterial routes is in the process of being digitized and inventoried by the agency's Geographic Information System (GIS) section. Plans for developing digital records for an additional 8,839 miles of local collector routes in the state are being formulated. Overall, some 29,173 miles of Nebraska roads information has been collected, is currently being processed, or is planned for future use as part of a statewide transportation geographic database.

Currently, there is no state plan for the development of an accurate digital geographic database for approximately 66,735 miles of roads. However, some local governments have developed geographic transportation databases as part of their transportation planning and maintenance efforts, or for E911 efforts. Research and planning efforts focused on developing a comprehensive geographic transportation database will need to explore the possibilities of integrating these locally developed transportation databases into a comprehensive statewide database, as well as exploring how other road networks, not currently available in a geographic database, can be developed.

NEED FOR A COOPERATIVE DATABASE DEVELOPMENT FUNDING MECHANISM

Within state government, there are currently broad public policy discussions related to the importance of enhancing the overall coordination of information technology investments by government agencies as a means to achieve the highest return on these public investments. As part of these discussions, consideration is being given to implementing new structures and procedures to encourage and facilitate this coordination. Within this context, the GIS Steering Committee has noted the need for a funding mechanism to encourage and support the cooperative development and maintenance of framework geospatial databases.

The key role of a select set of framework geospatial databases is widely known and appreciated among users of geospatial data. The importance of coordinated state, federal and local efforts to develop and maintain these framework databases is also widely appreciated. In Nebraska, a major institutional stumbling block that hinders the evolution of this cooperative development process is the lack of a clearly defined mechanism for funding interagency, intergovernmental geospatial database development efforts. Historically, most database development efforts have been funded by a particular agency that had the need for that database to support its specific statutorily defined mission. As a result, most of our public funding mechanisms flow through these institutional (agency) channels and are closely tied to those specific agency missions. While it is not impossible to utilize these funding channels, it is not an efficient mechanism for establishing cooperative intergovernmental database development priorities and to fund their development.

The GIS Steering Committee is charged in statutes (§81-2604) with the following duties:

- (1) Make recommendations to the Legislature for program initiatives and funding; and
- (2) Establish guidelines and policies for statewide Geographic Information System operations and management to include: a) The acquisition, development, maintenance, quality assurance such as quality control standards, access, ownership, cost recovery, and priorities of data bases; ...

In pursuit of its statutory responsibilities, the GIS Steering Committee has developed a white paper to illustrate the importance of specific framework databases and the need for a funding mechanism to support their cooperative development (*see page 22*). The Steering Committee has also passed a resolution stating its support for the development of such a cooperative funding mechanism (*see page 21*). The Steering Committee has also referred this need to the NITC for its consideration and proposed a study to further define the need for and benefits from such a cooperative geospatial database funding mechanism (*see page 10*).

FACILITATING LOCAL GOVERNMENT LAND RECORD MODERNIZATION

The modernization of how land records are maintained, accessed and shared at the local and state government level, is one of the most promising areas for future GIS application. In 1996, an intergovernmental Property Parcel Task Force, convened by the GIS Steering Committee, issued a working paper entitled "Facilitating Land Record Modernization in Nebraska". That working paper outlined the important role of land ownership and land records in our society and the benefits to be gained by using modern information technologies, such as GIS, to enhance the maintenance, access and utility of these records. The working paper also provided an overview of the issues involved in the adoption of these technologies and made recommendations to facilitate this adoption process. Among the working paper conclusions and recommendations were the following:

- Development of additional guidelines or standards is needed to facilitate the overall development and cooperative use of geospatial property parcel data.
- Local/state partnerships are needed in several areas to facilitate overall land record modernization
- Broad participation of a variety of interest groups is critically important to the successful adoption of this technology to land record management.

Since the publication of this working paper, the GIS Steering Committee has worked with several agencies and entities to encourage and facilitate initiatives to address some of the working paper's recommendations. The Steering Committee supported legislation (LB 924, 1998) to place in Nebraska statutes a formal definition of the Nebraska Plane Coordinate System, a standard map projection system used for local government mapping. The Steering Committee supported legislation (LB 924, 1998) to give the State Surveyors Office increased responsibility and resources to provide technical assistance to local governments with the georeferencing of land records. As the following subsections on guidelines, PLSS and DOQ database development and the need for state/local partnership illustrate, the Steering Committee continued its efforts in 1999 to facilitate local government land record modernization.

GUIDELINES FOR LOCAL GOVERNMENT LAND INFORMATION SYSTEMS

Over the last couple of years an intergovernmental advisory committee of the GIS Steering Committee has worked to address the need for standards and guidelines outlined in the Working Paper on Facilitating Land Record Modernization in Nebraska. Of necessity, this has been a slow methodical process involving a wide range of interests. This past year, the advisory committee developed draft guidelines and supporting narrative to assist local governments in the development of digital cadastral (property parcel) mapping and databases. Previously, the advisory committee has developed guideline sections on Geographic/Geodetic Control and Base (reference) Maps. These guidelines and explanatory narrative are available on the Internet at:

http://www.calmit.unl.edu/gis/LIS_Stds_Intro.html

PUBLIC LAND SURVEY SYSTEM DATABASE AND PROPERTY PARCEL DEVELOPMENT

The PLSS section corners in Nebraska are the basis for defining all land ownership in our state. Establishing reasonably accurate locational coordinates for these corners provides a critical foundation for modernizing local government land records. The GIS Steering Committee has worked through its PLSS Advisory Committee and the State Surveyors Office to test a methodology for developing upgradeable, mathematically-based estimates for PLSS corner coordinates. The first pilot PLSS database that was created using this methodology was for Adams County. Over the past year, this test PLSS database has been used by a private vendor to build a digital property parcels database for Adams County. In 1999, the State Surveyor has also used this methodology to develop PLSS databases for Merrick and Dodge Counties. The State Surveyors Office is also working with the Department of Property Assessment and Taxation in Dodge County to develop a relatively low-moderate cost procedure to convert paper property parcel maps to a digital format based on this PLSS database.

DIGITAL ORTHOPHOTOS

The joint effort by the Natural Resources Commission and the USGS to develop statewide digital orthophoto quadrangles (DOQs) has also helped to facilitate land record modernization. DOQs are terrain-corrected, geo-referenced aerial photography. The PLSS databases and DOQs together provide the database framework upon which local governments can base the development of their digital property parcel databases.

NEED FOR A COMPREHENSIVE LOCAL - STATE PARTNERSHIP STRATEGY

Over the last few years the GIS Steering Committee has sought, through a variety of initiatives, to address many of the issues and hurdles that were identified by the Working Paper on Facilitating Land Record Modernization in Nebraska. One of the issues the working paper raised was the importance of a developing state-local partnerships around the development and maintenance of land records. Many of the policy issues related to developing such local-state partnerships have yet to be thoroughly explored. Because of this, the GIS Steering Committee has forwarded to the Nebraska Information Technology Commission (NITC) a recommendation that an intergovernmental advisory committee be formed to research and make recommendations related to local government land record modernization, addressing the needs for compatibility across jurisdictional boundaries and adequate funding (*see page 11*).

EDUCATION AND OUTREACH ACTIVITIES

The GIS Steering Committee sees education as one of the most powerful tools it has to achieve its coordination role. This is reflected in its long-range goal to strengthen its overall educational program activities. With its limited resources, the Steering Committee works with cooperating agencies and entities on multiple approaches to achieve its education and outreach objectives.

1999 Nebraska GIS Symposium. The GIS Steering Committee served as the primary organizational base for the planning and implementation for a 1999 Nebraska GIS Symposium, which was held on May 11-12, 1999 in Lincoln's Cornhusker Hotel. The event was co-sponsored by 20 other organizations. The biennial Symposium has evolved to be the major Nebraska-based GIS education and outreach event. As part of the Symposium, nineteen 3-hour short courses, and fourteen 1.5-hour concurrent sessions, were offered over the two days. The attendance of over 300 at the Symposium illustrates the growing interest in GIS and the growing need for local opportunities for education and networking with others using the technology.

Nebraska GIS/LIS Association. As part of the planning for the 1999 Nebraska GIS Symposium, the GIS Steering Committee encouraged and supported the development of an organizing committee for a new private, non-profit Nebraska GIS/LIS Association (LIS - Land Information System). With the growing interest in GIS technology in Nebraska, it was hoped that such a non-profit organization could be an effective vehicle to help the Steering Committee address the growing outreach and educational needs. An organizational meeting held in conjunction with the Symposium was well attended. Since the Symposium, the new Association has sponsored three other regional events.

Presentations, Newsletters, and Publications. The GIS Steering Committee Coordinator, together with support from cooperating agencies, provides presentations and demonstrations to several organization meetings and gatherings annually. Among those events last year were the following: NACO Annual Conference, Annual Conference of the Nebraska Emergency Managers Association and the NRD Computer Users meeting. With the support of the Conservation and Survey Division - UNL and the Nebraska Department of Roads, the Steering Committee continues to publish a Nebraska GIS Update newsletter for the Nebraska GIS community. The Steering Committee also maintains an Internet website at: <http://www.calmit.unl.edu/gis/>, and through this site publishes numerous reports and white papers, such as the Guidebook for Local Government Multipurpose Land Information Systems.

Education and Outreach Resources Needed. The GIS Steering Committee continues to believe that public investment in GIS education and outreach programs for public officials will pay long-term dividends for Nebraska. The need is particularly acute in relation to local governments. Local governments make substantial investments in mapping and aerial photography in the on-going course of fulfilling their areas of responsibility. For many county commissioners, county assessors, and agency directors these are new areas of expertise. Resources are needed to develop educational materials and to plan and implement outreach and training programs. Public investments now in the education of public officials, will result in greater overall return from other public investments. The GIS Steering Committee has conducted limited efforts in this area, but the lack of program resources has severely handicapped this effort. For these reasons, the GIS Steering Committee has made the following recommendation to the Nebraska Information Technology Commission (*see page 11*).

Conduct an educational outreach program designed to maximize the overall return on local government investments in the development of geographically referenced databases and GIS systems by providing educational materials, presentations and coordination services to the public officials who will be making these investment decisions.

DEVELOPING RELATIONSHIP WITH NITC AND CIO

As part of the 1998 statewide Information Technology Coordination Initiative, additional statutory responsibilities were added to the GIS Steering Committee for reporting to, assisting and advising the new Chief Information Officer (CIO) and the Nebraska Information Technology Commission (NITC). Since that time, the GIS Steering Committee has actively sought to further define this relationship and provide support and assistance as requested. In 1998, the Steering Committee provided the NITC with its review of GIS-related new budget proposals. In 1999, the Steering Committee has had several discussions with NITC/CIO staff and has developed a draft charter (http://www.calmit.unl.edu/gis/NITC_Charter_for_GIS.pdf) to provide a basis for discussions to further define the relationship between the Steering Committee and the NITC. At the invitation of the NITC, the GIS Steering Committee has also forwarded the following action item proposals for possible inclusion in the State Technology Plan under development by the NITC.

Recommendation - DEVELOP STRATEGIES FOR PRIORITY DATABASES.

Develop and adopt strategies for the cooperative intergovernmental development, maintenance and distribution of priority statewide digital geospatial (GIS) databases.

Justification / Rationale. Geospatial information is a significant subset of the information explosion that has occurred over the last decade. In the broadest sense, geospatial databases are databases that include information about the location (street address, latitude/longitude, etc.) of features in the databases. For many information technology applications, this locational information is a key component that facilitates the mapping, integration and analysis of data. To maximize the utility of this locational information, geospatial information is coded in specific formats for use with software tools such as Geographic Information Systems (GIS).

Because a subset of geospatial databases are needed for a wide variety of applications, state, federal and local government agencies have identified this core subset of geospatial databases as priorities for development. These core databases should be considered as key components of the public information technology infrastructure, in that they provide a means for integrating geospatial data across multiple agencies, across different data themes, and across different geographic areas. The coordinated development and maintenance of these core databases would reduce the costly and unnecessary duplication of similar (but frequently incompatible) geospatial databases. The incorporation of specific database standards into widely used geospatial databases would also contribute to the widespread adoption of these standards.

Recommendation - STUDY COOPERATIVE DATABASE FUNDING MECHANISM

Conduct a study to determine the need for and merits of establishing a funding mechanism dedicated to facilitating collaborative intergovernmental efforts to develop priority statewide geospatial (geographically referenced) databases.

Justification / Rationale. It is widely accepted that the development and maintenance of many core geospatial databases is most efficiently achieved through the cooperative efforts of multiple agencies, frequently at different levels of government (state, local and federal). In many cases, current institutional structures create barriers to, rather than facilitate information technology collaboration. The establishment of a funding mechanism dedicated to collaborative geospatial database development has been proposed as one means to help overcome these institutional barriers and to facilitate this collaboration. The availability of at least a moderate

amount of funding dedicated to collaborative database development could provide an incentive to stimulate interagency, intergovernmental coordination. Such dedicated funding could provide both the seed funding and a mechanism for implementing large, statewide, cooperative database development efforts by pooling additional resources from multiple partner agencies. Oversight of a collaborative geospatial database development fund, by an intergovernmental coordinating body, could also provide a workable mechanism for implementing database development priorities which have been established through coordinated intergovernmental processes.

Any initiative to establish a new funding mechanism must address the issues of the need for the funding and the merits or benefits to be gained from the funding. To provide this background information, this study will seek to outline:

- the cross-section of need for these core geospatial databases,
- the estimated public investment needed to develop and maintain these core databases, and
- how a collaborative funding mechanism might facilitate their cooperative development.

Recommendation - DEVELOP STRATEGY FOR LAND RECORD MODERNIZATION

Develop and adopt a strategy to facilitate the modernization of local government land information systems (property ownership records, maps, etc.), addressing the needs for compatibility across jurisdictional boundaries and adequate funding.

Justification / Rationale. Property ownership is a fundamental aspect of our society and economy. Land record data is needed and used by public agencies at all levels of government. As a consequence, modern land record databases are a core component of our public information technology infrastructure and the modernization of land record information systems should be a public investment priority. In Nebraska, local governments are responsible for the management of land record information (ownership, location, size, shape, value, occupancy, use, etc.). Modern information technology (such as geographic information systems) has revolutionized how this information can be managed, accessed and utilized. GIS has greatly expanded the ability to share this core information across multiple agencies and also expanded the range of applications to which it can be applied (taxation, emergency response, economic development, resources management, public safety, community planning, precision agriculture, etc.).

It is in Nebraska's long-term interest to insure that its land records are current and maintained in a manner that takes advantage of and that is accessible through modern information technology. Land record information flows through and is maintained by local government offices. Unfortunately, except for the more populous counties, a lack of resources has prevented most local governments in Nebraska from investing in the modernization of their land record systems. Statewide efforts to facilitate the modernization of these land records will likely require initiatives to provide local governments with at least some of the necessary funding. Because it is important that these land records be compatible across jurisdictional lines, at least a minimal level of statewide coordination or standards will also be necessary.

Recommendation - CONDUCT GIS OUTREACH AND EDUCATION PROGRAM

Conduct an educational outreach program designed to maximize the overall return on local government investments in the development of geographically referenced databases and GIS systems by providing educational materials, presentations and coordination services to the public officials who will be making these investment decisions.

To maximize the return from public investments in the development of geographically referenced databases, additional resources are needed for outreach and education of public officials. This need is particularly acute in relation to local governments. Local governments make substantial investments in mapping and aerial photography in the on-going course of fulfilling their areas of responsibility. For many county commissioners, county assessors, and agency directors these are new areas of expertise. Resources are needed to develop educational materials and plan and implement outreach and training programs. Public investments now in the education of public officials, will result in greater overall return from other public investments. The GIS Steering Committee has conducted limited efforts in this area, but the lack of program resources has severely handicapped this effort.

Additional resources are also needed to work with public and private entities to encourage and facilitate cooperative geospatial data development efforts. In most situations where a public entity is considering an investment in geospatial data development, there are other entities that have similar geospatial data needs. In many situations, a major need is for someone to serve as the bridge to inform these various entities of their common interests in having particular types of data developed for a given area. By facilitating this type of cost/resource sharing, commonly needed geospatial databases can be developed that the individual partners would not have been able to undertake on their own. Resources are needed for on-going outreach to state, federal, and local government agencies, and private industry to understand their data needs and to share that knowledge with others that might share those needs.

Appendix

APPENDIX A

ARTICLE 26 GEOGRAPHIC INFORMATION SYSTEM

Section.

81-2601. Legislature; Intergovernmental Data Communications Advisory Council; findings

81-2602. Geographic Information System Steering Committee; created; members; appointment; terms; expenses.

81-2603. Committee; officers; advisory committees; meetings.

81-2604. Committee; duties.

81-2605. Committee; report.

81-2601. Legislature; Intergovernmental Data Communications Advisory Council; findings.

The Legislature finds that the Geographic Information System is a computer-based technology that captures, stores, analyzes, and displays information about the earth's surface from a geographically referenced system, that an interest in the system is rapidly increasing at all levels of government, and that an institutional mechanism is needed to encourage initiatives, coordinate efforts, avoid duplication, seek efficiencies, develop guidelines, policies, and standards for operations and management, promote education and training, and make recommendations so that such technology will benefit the entire state and endure as an analysis tool for decision makers.

The Intergovernmental Data Communications Advisory Council has found that there are many levels of experience, expertise, and hardware and software sophistication among the various levels of government and that guidelines, policies, coordination, and standards are required to realize the maximum benefits of this technology, avoid data quality problems., and resolve conflicts at a reasonable cost for the state.

It is the intent of the Legislature that a Geographic Information System Steering Committee be created with statewide responsibilities to take an active role in implementing the Geographic Information System. Such committee would help facilitate acquisition of such technology at all levels of government and make recommendations to the Legislature for program initiatives and funding and the fostering of communications, training, and education.

81-2602. Geographic Information System Steering Committee; created; members; appointment; terms; expenses. The Geographic Information System Steering Committee is hereby created and shall consist of eighteen members as follows:

- (1) The director or designee of the Department of Administrative Services, the Department of Environmental Control, The Conservation and Survey Division of the University of Nebraska, the Nebraska Natural Resources Commission, and the Governor's Policy Research Office;
- (2) The Director-State Engineer or designee;
- (3) The State Surveyor or designee;
- (4) The Clerk of the Legislature or designee;
- (5) The secretary of the Game and Parks Commission or designee;
- (6) The Property Tax Administrator or designee;
- (7) One representative of federal agencies appointed by the Governor;
- (8) One representative of the natural resources districts nominated by the Nebraska Association of Resources Districts and appointed by the Governor;
- (9) One representative of the public power districts appointed by the Governor;
- (10) Two representatives of the counties nominated by the Nebraska Association of County Officials and appointed by the Governor;
- (11) One representative of the municipalities nominated by the League of Nebraska Municipalities and appointed by the Governor; and
- (12) Two members at large appointed by the Governor.

The appointed members shall serve for terms of four years, except that of the initial members appointed by the Governor, one of the representatives of the counties shall be appointed for one year and the other shall be appointed for three years, one of the members at large shall be appointed for one year and the other for three years, and the representative of the public power districts shall be appointed for two years. Their successors shall be appointed for four-year terms. Any vacancy on the committee shall be filled in the same manner as the original appointment, and the person selected to fill such vacancy shall have the same qualifications as the member whose vacancy is being filled.

The members shall be reimbursed for their actual and necessary expenses as provided in sections 81-1174 to 81-1177.

81-2603. Committee; officers; advisory committees; meetings. The Geographic Information System Steering Committee shall elect a chairperson from its membership and such other officers as the committee deems necessary. As the need arises, advisory committees may be established by the committee from various levels of government, industry, or the general public to assist the committee.

The committee shall meet quarterly or upon the call of the chairperson.

81-2604. Committee; duties. The Geographic Information System Steering Committee shall:

- (1) Make recommendations to the Legislature for program initiatives and funding;
- (2) Establish guidelines and policies for statewide Geographic Information System operations and management to include:
 - (a) The acquisition, development, maintenance, quality assurance such as quality control standards, access, ownership, cost recovery, and priorities of data bases;
 - (b) The compatibility, acquisition, and communications of hardware and software;
 - (c) The assessment of needs, identification of scope, setting of standards, and determination of an appropriate enforcement mechanism;
 - (d) The fostering of training programs and promoting education and information about the Geographic Information System; and
 - (e) The promoting of the Geographic Information System development in the State of Nebraska and providing or coordinating additional support to address Geographic Information System issues as such issues arise;
- (3) Report to, assist, and advise the Chief Information Officer in setting information technology policy; and
- (4) Provide assistance as requested by the Nebraska Information Technology Commission to support the technical panel created in section 11 of this act.

81-2605. Committee; report. Annually, the chairperson of the Geographic Information System Steering Committee shall submit a written report, approved by the committee, to the Governor and the Clerk of the Legislature and shall send a copy of such report to the Intergovernmental Data Communications Advisory Council.

APPENDIX B

NEBRASKA GIS STEERING COMMITTEE

as of 12/22/99

Lash Chaffin - Chair

League of Nebraska Municipalities
1335 L Street
Lincoln, Nebraska 68508
Voice: (402) 476-2829, FAX: (402) 476-7052
Email: lashchaffin@netscape.net

Rick Becker

Coordinator, Info. Res. Cabinet - DAS
* representing Lori McClurg, DAS Director
521 S. 14th Street, Suite 200
Lincoln, Nebraska 68508
Voice: (402) 471-7984, FAX: (402) 471-4608
Email: rbecker@cio.state.ne.us

Blaine R. Dinwiddie

Omaha Public Power District
444 S. 16th St. Mall, ECC-2
Omaha, Nebraska 68102
Voice: (402) 552-5130, FAX: (402) 636-3947
Email: bdinwiddie@oppd.gov

Val Goodman

* representing Patrick O'Donnell, Clerk of the Leg.
Legislative Technical Center
Room 359C, State Capitol
Lincoln, Nebraska 68509
Voice: (402) 471-2420, FAX: (402) 471-2126
Email: vgoodman@unicam.state.ne.us

Mele Koneya

* representing Rex Amack, Director
Nebraska Game and Parks Commission
P.O. Box 30370, 2200 N. 33rd St.
Lincoln, Nebraska 68503
Voice: (402) 471-5484, FAX: (402) 471-5528
Email: mkoneya@ngpsun.ngpc.state.ne.us

Catherine D. Lang, Property Tax Administrator

Dept. of Property Assessment and Taxation
1033 'O' Str., Suite 600
Lincoln, NE 68508
Voice: (402) 471-5984, FAX: (402) 471-5993
Email: cdlang@pat.state.ne.us

John Miyoshi

Lower Platte North NRD
P.O. Box 126
Wahoo, Nebraska 68066
Voice: (402) 443-4675, FAX: (402) 443-5339
Email: miyoshi@nrcdec.nrc.state.ne.us

Mark Kuzila, Director - Vice Chair

Conservation and Survey Division - UNL
113 Nebraska Hall, University of Nebraska
Lincoln, NE 68588-0517
Voice: (402) 472-7537, FAX: (402) 472-2410
Email: mkuzila@unlnotes.unl.edu

James L. Brown

State Surveyor
555 North Cotner Blvd
Lincoln, Nebraska 68505
Voice: (402) 471-2566, FAX: (402) 471-3057
Email: jbrown@sso.state.ne.us

Dick Genrich

* representing John L. Craig, Director
Department of Roads
P.O. Box 94759
Lincoln, Nebraska 68509-4759
Voice: (402) 479-4550, FAX: (402) 479-3884
Email: dgenrich@dor.state.ne.us

Lauren Hill

Director
Governor's Policy Research Office
Rm 1319, State Capitol, P.O. Box 94601
Lincoln, Nebraska 68509
Voice: (402) 471-2414, FAX: (402) 471-2528
Email: lhill@pro.state.ne.us

Thomas Lamberson, Deputy Director

* representing Michael Linder, Director
Department of Environmental Quality
P.O. Box 98922, 1200 "N" St., Suite 400
Lincoln, Nebraska 68509-8922
Voice: (402) 471-4235, FAX: (402) 471-2909
Email: deq112@mail.deq.state.ne.us

Nathan McCaleb, State Soil Scientist

Natural Resources Conservation Service
Federal Building, Room 152, 100 Centennial Mall North
Lincoln, NE 68508
Voice: (402) 437-4113, FAX: (402) 437-5327
Email: nathan.mccaleb@ne.usda.gov

Richard Nelson, Director

Dept. of Regulation and Licensure, HHS
P.O. Box 95007
Lincoln, NE 68509
Voice: (402) 471-8566, FAX: (402) 471-0820
Email: Dick.Nelson@HHSN.state.ne.us

Duane Stott
Scotts Bluff County Surveyor
P.O. Box 690, 785 Rundell Road
Gering, Nebraska 69341
Voice: (308) 436-6654, FAX: (308) 436-3154
Email: scb-co@PrairieWeb.COM

Dayle Williamson, Director
Natural Resources Commission
301 Centennial Mall South
Lincoln, Nebraska 68509-4876
Voice: (402) 471-2081, FAX: (402) 471-3132
Email: daylew@nrcdec.nrc.state.ne.us

Larry Worrell
Lancaster County Surveyor
444 Cherrycreek Road, Bldg. C
Lincoln, Nebraska 68528
Voice: (402) 441-7681, FAX: (402) 441-8692
Email: lworrell@ci.lincoln.ne.us

Cliff Welsh
Keith County Commissioner
1225 Road West 40
Brule, Nebraska 69127-2101
Voice: (308) 287-2251
Email: kcland@megavision.com

Dennis Wilson
Omaha Public Works
1819 Farnam, Suite 600
Omaha, Nebraska 68183
Voice: (402) 444-5100, FAX: (402) 444-5248
Email: dwilson@ci.omaha.ne.us

Larry K. Zink - **GIS Steering Committee Coordinator**
Intergovernmental Data Services Div. - DAS
521 S. 14th Street, Suite 101
Lincoln, Nebraska 68508
Voice: (402) 471-3206, FAX: (402) 471-4864
Email: lzink@notes.state.ne.us

Resolution Encouraging Pilot Project Efforts to Develop a 1:24,000 National Hydrography Dataset for Nebraska

- Whereas:* Water and water-related issues play an important role in the economic, legal, and political life of Nebraskans,
- Whereas:* Numerous state, federal, and local public agencies and private interests collect and maintain separate water-related data which is utilized in a wide variety of management and regulatory applications,
- Whereas:* The existence of a common hydrographic reference dataset would greatly enhance the ability of agencies to integrate multiple, stream-related datasets and thereby strengthen the resultant policy and management decision-making processes that depend on those datasets,
- Whereas:* The Federal Geographic Data Committee, the National States Geographic Information Council, the Nebraska GIS Steering Committee and numerous state and local agencies have all noted the importance of a common hydrography reference database and have designated geospatial databases of this type as a priority for development, and consequently, the Nebraska GIS Steering Committee established a Water Resources Database Advisory Committee to study and make recommendations related to the development of hydrographic databases,
- Whereas:* The Advisory Committee found that the draft standards for the 1:100,000 scale National Hydrography Dataset, as developed jointly by the U.S. Geological Survey and the U.S. Environmental Protection Agency, incorporate an array of database features designed to facilitate its use as a common geospatial reference dataset for a wide array of stream-related data collection and applications, including numerical identifiers for stream segments and lakes, common stream and lake feature names, scale-appropriate delineation of stream and lake features including banks and shorelines, and continuous centerline water flow paths for downstream network flow analysis,
- Whereas:* The Advisory Committee found that for many state and local water-related applications, a hydrographic dataset developed at the 1:100,000 scale does not have sufficient spatial accuracy (90% of the points within 167 feet) and that a dataset developed at the 1:24,000 scale (90% of the points within 40 feet) is more appropriate for many of these state and local applications, and
- Whereas:* The Advisory Committee, based upon its research, has recommended that the GIS Steering Committee encourage and facilitate cooperative efforts by state, local, and federal agencies to undertake 1:24,000 National Hydrography Dataset pilot projects as an important step toward the development of a statewide database.

Now Therefore, be it resolved:

- Section 1.* That a 1:24,000 scale National Hydrography Dataset (NHD), based generally on 1:100,000 scale NHD standards, but with an enhanced 1:24,000 stream vector coverage, would provide Nebraska with a common geospatial reference database for a wide range of applications for which the location and/or the characteristics of streams or other water bodies is an important consideration, and therefore this geospatial database should be a high priority for statewide, database infrastructure development.
- Section 2.* That a pilot project to develop a 1:24,000 NHD for one or more of Nebraska's hydrographic catalog unit (watershed) areas would provide the opportunity:
- a. to identify and resolve standards issues related to Nebraska-specific statutes and other database needs,
 - b. to determine optimal database development methodologies and procedures, and to establish a baseline for the resources needed to develop a statewide 1:24,000 NHD for Nebraska.
 - c. to establish a baseline for the resources needed to develop a statewide 1:24,000 NHD for Nebr.
- Section 3.* That the Nebraska GIS Steering Committee requests that cooperating agencies review current and planned projects that involve water-related geospatial database development efforts to determine the feasibility of incorporating 1:24,000 NHD standards into those efforts, and encourages state, local and federal agencies to explore other possibilities for supporting cooperative efforts to undertake 1:24,000 NHD pilot projects and eventual statewide development.

Resolution on Cooperative Efforts to Enhance the Locational Information Available for Registered Water Wells in Nebraska

- Whereas:* Groundwater and groundwater-related issues play an important role in the economic, legal, and political life of Nebraskans,
- Whereas:* Numerous state, federal, and local public agencies and private interests collect and maintain data on Nebraska's water wells which is utilized in a variety of management and regulatory applications,
- Whereas:* The Registered Wells Database, maintained by the Nebraska Department of Water Resources, is a common reference database that contains information on over 100,000 registered water wells and includes locational coordinates for these wells that are currently based on mathematical estimates related to the well's original registered location relative to a specified PLSS section or quarter-section,
- Whereas:* Several state, local and federal agencies require more accurate spatial information on the location of water wells and have undertaken efforts to this more accurate locational information using Global Positioning Satellite (GPS) technology and through these separate, on-going efforts collected more accurate locational readings on approximately 16,000 Nebraska water wells,
- Whereas:* The lack of interagency agreements, resources, and methodologies to efficiently and systematically transfer and incorporate this data into the Registered Wells Database has meant that much of this more accurate locational data, collected by a variety of agencies, is currently not getting incorporated into the Registered Wells Database,
- Whereas:* The Nebraska Department of Water Resources and several of the state, local and federal agencies that are doing the field work to collect this GPS well data have recognized the importance of incorporating this more accurate spatial data into the Registered Wells Database, and working as a subcommittee of the Water Resources Database Advisory Committee of the Nebraska GIS Steering Committee, have developed documentation standards and methodologies to facilitate the transfer and incorporation of this data into the Registered Wells Database.

Now Therefore, be it resolved:

- Section 1.* The Nebraska GIS Steering Committee concurs with the assessment that enhancement of the spatial accuracy of the locational information on water wells in the Registered Wells Database is an importance objective, and that cooperative efforts to achieve this objective will enhance the overall utility of this database for multiple state, local and federal agency users of the database.
- Section 2.* The GIS Steering Committee applauds the interagency effort of participating state, federal and local agencies to develop standards and methodologies to facilitate the efficient incorporation of enhanced locational data, that has been collected by a variety of other agencies, into the Registered Wells Database and appreciates the willingness of these agencies to organize and share the data they have collected as a result of field work.
- Section 3.* The GIS Steering Committee also appreciates the willingness of the Department of Water Resources to devote scarce resources to this interagency effort to enhance this commonly used Register Wells reference database.
- Section 4.* The GIS Steering Committee urges agencies collecting GPS-based locational data on Nebraska water wells to cooperate with this interagency effort by organizing and documenting their information in a manner consist with the "Codes for Inclusion of Locational Data in the Nebraska Department of Water Resources Registered Wells Database", as developed by this interagency working group, and to work with the Department of Water Resources to transfer this data in a manner designed to achieve the maximum efficiency for both agencies.

Resolution Endorsing A Pilot Project to Develop Updated and Revised DOQ/DEM Datasets for Lancaster County, Nebraska

- Whereas:* Digital Orthoimagery and Elevation databases have been determined to be priority databases for development by the Nebraska GIS Steering Committee,
- Whereas:* Orthoimagery and Elevation databases have been determined by the Federal Geographic Data Committee (FGDC) to be Framework Databases because of their use by a wide cross-section of geospatial data users,
- Whereas:* The Natural Resources Commission and the U.S. Geological Survey has completed a highly successful three-year partnership effort by developing a statewide 1:24,000 (30-meter interval) Digital Elevation Model (DEM) coverage and a statewide 1:12,000 Digital Orthophoto Quadrangle (DOQ) coverage based on 1992-93 aerial photography.
- Whereas:* New statewide aerial photography collected during 1999 as part of the National Aerial Photography Program (NAPP) offers the availability of more recent source material for updating these DOQs with current photoimagery.
- Whereas:* An intergovernmental Advisory Committee on Orthoimagery and Elevation Databases, authorized by the Nebraska GIS Steering Committee, has recommended a pilot project study for Lancaster County to determine the resources required, the optimum production methodology, and the final product specifications needed for the next generation of statewide DOQ/DEM coverages.

Now Therefore, be it resolved:

- Section 1.* That DOQs/DEMs provide important reference databases that are widely used by a range of geospatial data users, that for many of those users the timeliness of orthoimagery data is a significant factor in the utility of the database, and that it is prudent to study and plan for the resources and methodologies that will be required to keep these databases updated.
- Section 2.* The Nebraska GIS Steering Committee expresses its support for a joint effort by the Nebraska Natural Resources Commission and the U.S. Geological Survey to undertake a pilot project study to develop revised and updated DOQs/DEMs for Lancaster County, Nebraska with the final county-wide product consisting of revised DEMs based on a 10-meter interval grid and the updated DOQs based on 1999 NAPP photoimagery projected in both Universal Transverse Mercator (UTM) and the Nebraska Plane Coordinate Systems.
- Section 3.* As part of this Lancaster County pilot project study, the following issues will be researched and the results reported back to the GIS Steering Committee for its consideration in endorsing any future statewide DOQ/DEM update effort:
- a. the resources required and the database quality gains/losses (horizontal and/or vertical) achieved by revising the current 30-meter interval DEMs to 10-meter interval DEMs,
 - b. the resources required and the optimum methodology investigated for developing the DOQs in the Nebraska Plane Coordinate System in addition to the UTM coordinate system, and
 - c. the optimum methodology, and related considerations researched for developing the updated DOQs based on the currently available DOQs and existing ground controls data.

Resolution on Geospatial Data as Information Technology Infrastructure in Need of a Cooperative Funding Mechanism to Facilitate its Development

Whereas: Geospatial information is a significant subset of the information explosion that has occurred over the last decade and a wide and rapidly expanding range of information technology applications rely on geospatial databases and their embedded geographic location data as a key component of the information that facilitates the mapping, integration and analysis of the data.

Whereas: A select set of geospatial databases has been identified as framework databases (roads, streams property parcels, etc.), as they provide a foundation for the development of numerous other geospatial databases and a means for sharing and integrating these databases across a wide range of public and private sector applications, and as such, these framework geospatial databases are fundamental components of an underlying information technology infrastructure that supports a wide range of applications for which geographic location is a key component of the information.

Whereas: The cooperative development of framework geospatial databases can play a pivotal role in designing, implementing, and promoting geospatial data standards to ensure that the databases will address the widest practical range of needs for a given level of investment.

Whereas: The development of a select set of framework geospatial databases, incorporating the database features and standards needed to address a wide variety of user needs, is a solid public investment because the long-term public dividends will include:

- Minimizing the duplication of effort to develop similar databases,
- Increasing the sharing of geospatial databases among agencies,
- Facilitating the integration and analysis of data from multiple agencies, and
- Enhancing the overall quality of public policy decisions due to improved availability of information.

Whereas: In response to recent broad public policy discussions related to the importance of enhancing the overall coordination of information technology investments by government agencies, the Nebraska Legislature charged the Nebraska Information Technology Commission with developing a statewide technology plan that incorporates long-range funding strategies (Nebr. Rev. Stat. Section 86-1506).

Now Therefore, be it resolved:

Section 1. That the Nebraska GIS Steering Committee believes that there is a need for, and urges the establishment of, a cooperative funding mechanism, specifically designed to facilitate the collaborative development and maintenance of framework geospatial databases, key elements of Nebraska's information technology infrastructure.

Section 2. That the Nebraska GIS Steering Committee believes that regardless of the specific institutional approach taken to establish such a cooperative geospatial database funding mechanism, its overall effectiveness would be maximized by incorporating the following considerations:

- a) oversight by a coordinating body knowledgeable about geospatial data needs,
- b) adherence to established geospatial data standards,
- c) recognition of the need for periodic maintenance of dynamic databases,
- d) commitment to data sharing among public institutions,
- e) provision of a sufficient level of funding to enable multi-year development projects, and
- f) coordination with the Nebraska Information Technology Commission.

Geospatial Data as Information Technology Infrastructure and the Need for a Cooperative Funding Mechanism to Facilitate its Development

Geospatial information is a significant subset of the information explosion that has occurred over the last decade. In the broadest sense, geospatial databases are databases that include information about the location (street address, latitude/longitude, section/township/range) of features in the databases. For many information technology applications, this locational information is a key component that facilitates the mapping, integration and analysis of data.

There is a wide and rapidly expanding range of information technology applications that rely on these geospatial databases and their embedded locational information. An emergency response application is the ability to rapidly convert the telephone number of an incoming emergency 911 call to a map showing the location of the original call and the most rapid avenue of response. A public safety example is the ability to map a group of similar crimes or accidents to identify patterns that might assist in solving or preventing these incidents. An environmental application is the use of the geographic location of features to explore the relationship of factors that may influence surface and/or ground water quality: potential sources of pollution (agricultural or industrial), soil type, ground slope, depth to groundwater, etc.

An economic development application is the capability to compile and map, in a timely manner, the information that a manufacturing plant developer might need to identify and evaluate potential development sites in different states. Some of the information that such a development might require includes: the location of potential properties, the availability and nature of transportation systems in the area, the nearby availability of qualified personnel, the proximity of available suppliers, and nature and the availability of utility infrastructure. For all of this information, location is an important component and it can provide a reference for bringing the information together and for analyzing and displaying it.

Framework Geospatial Databases ³/₄ Information Technology Infrastructure.

In this rapidly growing area of information technology, a select set of geospatial databases has been identified as framework databases. These framework databases provide a foundation for the development of numerous other geospatial databases and a means for sharing and integrating these databases across a wide range of public and private sector applications. As such, these framework geospatial databases are fundamental components of an underlying information technology infrastructure that supports a wide range of applications for which geographic location is a key component of the information. Examples of these framework geospatial databases include: road networks, rivers and streams, section corners, property parcel boundaries, political boundaries, and geo-referenced aerial photography.

Within state government, there are currently broad public policy discussions related to the importance of enhancing the overall coordination of information technology investments by government agencies as a means to achieve the highest return on these public investments. As part of these discussions, consideration is being given to implementing new structures and procedures to encourage and facilitate this coordination. Within this context, this paper outlines the need for consideration of public policies to establish funding mechanisms to support the cooperative development and maintenance of framework geospatial databases.

Geography ^¾ An Increasingly Important Foundation for Referencing Information.

The geographic component of information has become increasingly important as information technologies, such as Geographic Information Systems (GIS), have been developed to display and analyze information based on its location. GIS is a computer-based tool that integrates the mapping (spatial/graphical component) and database (tabular alpha-numeric component) aspects of information.

As the volume and use of digital information has grown, society has required commonly understood reference bases or foundations with which to link and combine information. Several such information references or links have evolved over time. For example, in this country much information is now referenced and can be accessed by unique personal identifiers (the social security number, telephone number, etc.). In a similar vein, the growing use of geographically referenced information is now addressing the acknowledged need for an information referencing scheme related to "space" or geographic location.

Historically, we have defined location or place by a variety of methods (street address, post office rural route, zip code, section/township/range, county, latitude/longitude, etc.). When we automate the use of geographic information for the integration and analysis of data, some locational reference methods (i.e., latitude/longitude) are more adaptable than others (i.e., rural route) for use within a GIS. In automating the use of geographic information, it is important to develop and implement standards for collecting and recording this geographic information. These and other geospatial data standards are important not only within a given organization, but also across organizations, as we seek to gain efficiency and provide improved service by sharing information between organizations.

Framework Geospatial Databases ^¾ A Key to Database Standards.

The cooperative development of framework geospatial databases can play a pivotal role in designing, implementing, and promoting geospatial data standards. An early step in any cooperative geospatial framework data development effort should be the development of consensus database standards to ensure that the resultant database will address the widest practical range of needs for a given level of investment. This interactive process can determine how the locational coordinates of features are stored in the database, determine the locational accuracy needed by a range of potential database users, determine what features will be incorporated in the database and establish unique identifiers for all database features.

The development of framework geospatial databases that have been designed through such collaborative processes will do much to promote the widespread adoption and implementation of the geospatial database standards. The development of most geospatial databases requires a substantial investment of time and resources. If an existing database is already available that meets an agency's needs, it is very likely that database will be used. The likelihood of an agency choosing to use an existing geospatial database is further enhanced if the database was developed using recognized standards.

When an agency chooses to use an existing geospatial database in a given application, it is likely that agency will also choose to incorporate the standards built into the existing database into other databases that are derived as part of that application. In this way, the standards that have been incorporated into key databases tend to migrate to and be implemented in other databases. This tendency of database standards to migrate is particularly pronounced with framework geospatial databases because these databases are used in such a wide variety of applications, and because they are frequently used as a foundation for the development of other databases.

Framework Geospatial Databases ^¾ A Solid Public Infrastructure Investment.

The development of a select set of framework geospatial databases, incorporating the database features and standards needed to address a wide variety of user needs, requires a significant up-front investment of public resources. However, such an investment in geospatial database infrastructure is a solid public investment because of the long-term public dividends that will result. Among these long-term dividends are the following:

- minimizes the duplication of effort by multiple agencies who otherwise would invest scarce public resources in the development and maintenance of similar sets of commonly needed geospatial databases;
- increases the sharing of geospatial data among agencies and levels of government by building a cooperative data-sharing culture and infrastructure based on shared data standards;
- facilitates the ability to integrate and analyze geospatial data related to a single geographic area, but originating from multiple agencies;
- facilitates the ability to piece together geospatial data from a variety of sources and from dispersed geographic areas into a coherent regional/statewide database mosaic; and
- enhances the quality of public policy decisions and the efficiency of service delivery due to the ability to integrate and analyze data from multiple public and private agencies.

While the development of this framework geospatial data infrastructure will require a substantial public investment, the lack of public policy decisions to make these infrastructure investments will likely result in higher long-term public costs. Absent a coordinated effort to develop these framework geospatial databases, a likely scenario is that multiple agencies will develop pieces of similar databases for their particular geographic area of need or responsibility. Even if consensus framework database standards already exist, there are likely to be numerous instances in which these framework database standards will not be followed. Consensus framework database standards are designed to meet the multiple needs of a variety of potential users. In many cases, their full implementation will be more costly than the development of a similar database that is designed to meet only the needs of the particular agency that is actually producing the data. Without a cooperative database funding source that is tied to these framework database standards, it is unlikely that most local governments or state agencies will make a greater investment than that which would be required to meet the needs specifically related to their mission or area of responsibility. Thus, while each of these individual geospatial database development efforts may be less costly, the combined public costs of multiple databases of a similar nature that are likely to be developed for the similar geographic areas will likely be higher than a cooperative public investment made in the development of framework geospatial databases.

Added to these public costs associated with the development and maintenance of duplicate/similar geospatial databases for the same area, are the costs incurred when one can not easily integrate data from different sources because they were not developed with the same standards. One example of this might be the difficulty in integrating state and local road networks across county lines in the case of an emergency. Another example is the difficulty of integrating a state agency's surface water data with a local or federal agency's data for the same stream. The public costs in these situations would come either from the inability to respond in a timely, efficient manner to an emergency; the possibility of inappropriate public policy decisions made on surface water issues because of the inability to consider all the data; or through the costs of the personnel resources required for the on-going conversion of one or more databases, in order to integrate the data. In the case of framework databases, these indirect public costs are compounded because databases of these types are frequently used as a foundation for the development of numerous other databases, thus spreading this problem of database incompatibility.

Funding Mechanism Needed For Cooperative Geospatial Database Development.

The key role of a select set of framework geospatial databases is known and widely appreciated among users of geospatial data. The Federal Geographic Data Committee (FGDC) has identified seven types of geospatial data as framework data: geodetic control, orthoimagery (aerial photography), elevation, transportation, hydrography (streams), governmental units (boundaries), and cadastral (property interests) information. The FGDC, a federal-level geospatial data coordinating body, has urged federal agencies to work together at the federal level and with state and local government to develop and maintain these framework databases. The National States Geographic Information Council (NSGIC), a national organization of state GIS/geospatial data coordinating bodies, has also endorsed this concept of a coordinated state, federal and local effort to develop and maintain these framework databases. The Nebraska GIS Steering Committee has identified these same databases, along with county soils surveys and land cover/use, as priority databases for development.

In Nebraska, a major institutional stumbling block that hinders the evolution of this cooperative development process is the lack of a clearly defined mechanism for funding interagency, intergovernmental geospatial database development efforts. Historically, most database development efforts have been funded by a particular agency and/or level of government that had the need for that database to support its statutorily defined mission. As a result, most of our public funding mechanisms flow through these institutional (agency) channels and are closely tied to those specific agency missions. While it is not impossible to utilize these funding channels, it is certainly not an efficient mechanism for establishing cooperative interagency, intergovernmental database development priorities and to fund their development.

In some instances, the development of a framework geospatial database may be closely related to a given agency's mission. In these cases, it may be appropriate to rely upon these established agency funding channels as the primary mechanism to fund the bulk of a given database development effort. However, even in these cases, it is common that additional database features and/or standards are needed by other agencies to maximize the overall utility of a particular database. In these cases, the existence of a separate cooperative database funding mechanism, which could contribute to another agency's database development project, would increase the likelihood that these other features would be incorporated into the database and thereby maximize the public's overall return on this investment.

Federal government agencies are seeking to coordinate with state agencies, and state agencies are seeking to coordinate with local and regional public bodies in the development and maintenance of these framework geospatial databases. In some cases, this coordination can be accomplished through work-share agreements between agencies. However, frequently the most efficient approach is to have one entity do the work and the other entities or levels of government contribute to the database development project via financial contributions. A specific, stable funding mechanism for cooperative geospatial database development would be a great help in overcoming the institutional barriers to these cooperative efforts.

With certain framework databases, the need for a given database is widespread, and yet the responsibility for any particular agency to take the lead in its development is not clear. An example in Nebraska is a high resolution hydrography (streams and lakes) database. This database is a priority need for several state, local and federal agencies, and yet none of them has the clear responsibility, nor the available resources to be the primary underwriter of this database development effort. A sustainable funding mechanism for cooperative geospatial database development could serve as the institutional catalyst to help bring the resources of these potential partners together to develop this needed database.

Elements to Consider in Designing a Cooperative Funding Mechanism

A variety of institutional approaches could be taken to establish a mechanism for funding cooperative geospatial databases. However, regardless of the institutional approach taken, to maximize its overall effectiveness, any approach for funding cooperative geospatial data development should incorporate the following considerations:

- oversight by a coordinating body knowledgeable about geospatial data needs,
- adherence to established geospatial data standards,
- recognition of the need for periodic maintenance of these dynamic databases,
- commitment to data sharing among public institutions,
- provision of a sufficient level of funding to enable multi-year development projects, and
- coordination with the Nebraska Information Technology Commission.

The state has been successful in establishing a mechanism for the efficient coordination of the hardware and software infrastructure related to data and voice communications. The coordination of geospatial data infrastructure offers a comparable challenge. With sufficient public coordination and investment, Nebraska institutions can head down the road of cooperative geospatial data development. Such a path would encourage and facilitate data sharing between levels of government and agencies, and enable agencies to integrate data across data themes and across geographic areas. Without this coordination and investment, different agencies and levels of government will likely duplicate similar databases and create databases, which are difficult to integrate due to the lack of consensus database standards.